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Supporting Community-Based Inshore Fisheries Management in Melanesia to Achieve Conservation Goals

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Prepared by:
Richard J. Hamilton[1] and Andrew J. Smith[1]

Pacific Island Countries Coastal Marine Program
The Nature Conservancy

Author Contact Details:
[1] 51 Edmondstone Street, South Brisbane, Qld, 4101, Australia.
Emails: rhamilton@tnc.org and andrew_smith@tnc.org

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Paper Available From:
Indo-Pacific Resource Centre
The Nature Conservancy
51 Edmondstone Street
South Brisbane, QLD 4101
Australia

Cover photo: Drova Island, Manus Province, Papua New Guinea (A. Smith)

ABSTRACT

Marine conservationists in Melanesia are frequently focused on preserving areas of high biodiversity via the establishment of permanent marine reserves. Traditional reef owners however, are typically far more interested in addressing short to medium term inshore fisheries management issues such as overfishing. To achieve these objectives traditional reef owners often place *tambus* (temporary closures) on certain areas of their customary sea estates. Because of these different approaches, western concepts of biodiversity conservation and permanent no take marine reserves rarely gain widespread support from coastal communities in Melanesia. In some cases, alternative developments have been provided to communities that forgo harvesting certain areas of their customary sea estates, although these attempts have not always proven effective. Instead of compensating traditional reef owners for establishing permanent closures, a more cost effective and broadly applicable approach may be to incorporate high priority conservation goals into community-based management schemes that are supported by NGOs and fisheries agencies. In this paper we draw on three case studies from coastal Melanesia to show how The Nature Conservancy (TNC) is assisting communities in their efforts to conserve grouper spawning aggregation sites. Lessons learned to date show that with a limited amount of educational awareness and some technical support, many Melanesian communities will take measures to manage their spawning aggregations, with temporary and seasonal site based closures and restrictions on destructive fishing methods being the most commonly adopted management polices. Importantly, communities only attempted to manage aggregations that occurred within well defined and uncontested customary sea tenure boundaries.

INTRODUCTION

Networks of permanent no-take marine reserves are increasingly being promoted as effective tools for both conservation and fisheries management (e.g. Bergan & Carr, 2003; Roberts & Hawkins, 2000; Roberts *et al*., 2001; Roberts *et al.,* 2003; Walmsley & White, 2003). However establishing networks of permanent marine reserves in Melanesia is unlikely to be widely successful for several cultural and political reasons. One of the primary reasons relates to ownership. In Melanesia, inshore marine ecosystems are not owned by the state, but by clans or tribes who continue to claim customary ownership over the mangroves, lagoons and reefs in their nearby vicinity. This traditional form of communal ownership is often referred to as Customary Marine Tenure (CMT) (Ruddle *et al.*, 1992), and it is recognised to varying degrees in government law in both the Solomon Islands (The Fisheries Act 1998) and Papua New Guinea (Fisheries Management Act 1998). The existence of CMT means that any effort to form permanent marine reserves requires initiatives from the customary owners. Typically however, resource owners in Melanesia do not perceive the need for or benefits of permanently closing off areas of their traditional fishing grounds. Furthermore, the concept of conserving biodiversity for its own sake is a Western one. In Melanesia natural resources are valued solely in relation to their usefulness, and the notion of species as something that should be protected for its own intrinsic value is simply not embraced (Foale, 2001). In some cases conservationists who are working in Melanesia have provided alternative developments to communities that forgo harvesting areas of high conservation value (Foale, 2001; Aswani & Hamilton, 2004). In the Pacific however, alternative income generating projects have often been unsuccessful in reducing harvesting pressure on coastal resources in the long run (World Bank, 1999; Foale, 2001).

While Melanesians may not value biodiversity conservation *per se*, they are often interested in managing their valuable inshore fisheries resources. Some contemporary examples of community based fisheries management initiatives in Melanesia include; restricting access to traditional fishing grounds, placing *tambus* (temporary closures) on reefs in order to allow valuable stocks to recover, banning destructive fishing practices and placing gear restrictions on certain important stocks (Foale, 1998; Hamilton, 2003; Hviding, 1991, Ruddle *et al*., 1992).

In this paper we present three case studies that show how in the correct ecological, social and political settings, conservationists can use communities concerns with maintaining harvests to achieve their conservation agendas. We limit our discussion to The Nature Conservancy's (TNC) ongoing efforts to reduce the over-exploitation and degradation of reef fish spawning aggregation sites in Melanesia[1]. Many species of reef fish form spawning aggregations, where large numbers (up to many thousands) of mature fish travel to a specific location at a specific time for the purpose of reproduction (Domeier & Colin 1997; Colin *et al.,* 2003). These spawning aggregations are often the only known reproductive opportunities for many species and their conservation and management is critical for the persistence of the populations that form them (Sadovy & Vincent 2002). Throughout the world many exploited spawning aggregations are severely over fished (Sadovy & Domeier, 2005), and in Melanesia reef fish spawning aggregations are being increasingly targeted for both local and commercial Live Reef Food Fish Trade (LRFFT) markets (Johannes & Lam, 1999; Hamilton, 2003; Sadovy *et al*., 2003; Hamilton *et al*.,2005).

The target areas where TNC is working on spawning aggregation conservation issues in Melanesia are Manus and New Ireland Province in Papua New Guinea and Choiseul Province in the Solomon Islands (Figure 1). Although these areas represent a range of environmental, social and economic conditions, we have maintained some fundamental principals that drive our community based conservation efforts. Our first principle is Knowledge. Knowledge of CMT estates tells us to what extent communities can make and enforce local rules on their traditional fishing grounds, and this information informs us on where our conservation efforts should be based. Our second principle is Awareness. We maintain that early on in any conservation program it is fundamentally important to clearly explain to all stakeholders the need for and benefits of fisheries conservation. During awareness efforts we were always upfront about our agenda, explaining to stakeholders that while marine conservation can have fisheries benefits, TNCs primary focus is on biodiversity conservation not resource management. Our third principle is Support. Awareness programs alone will often be inadequate in achieving conservation goals. Long term technical support and advice must be provided to communities that wish to manage their marine resources.

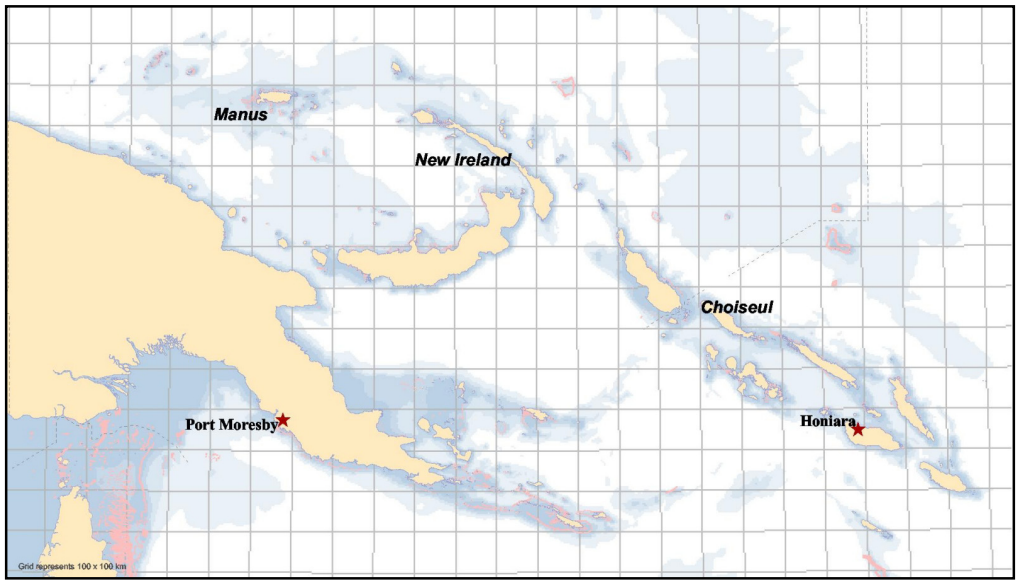

Figure 1: Map of Papua New Guinea and the Solomon Islands showing the locations of Manus, New Ireland and Choiseul Province.

[1] Although TNC seeks to address how to best conserve and manage all exploited reef fish aggregations in Melanesia, particular importance has been placed on conserving transient spawning aggregation sites (Domeier & Colin, 1997) that are used by large commercially important groupers.

CASE STUDY 1: MANUS PROVINCE, PAPUA NEW GUINEA

The locations, biological parameters and status of more then ten grouper spawning aggregations in Manus were documented in several local knowledge and Underwater Visual Census (UVC) surveys that were commissioned by National Fisheries Authority, TNC and the Society for the Conservation of Reef Fish Aggregations (SCRFA) (Squire, 2001; Hamilton, 2003, Hamilton *et al*., 2004). Out of all of the known aggregation sites, three sites immediately stood out as being of very high conservation priority. These three spawning aggregation sites are all located on reefs along the south coast of Manus Island. They are by far the largest and most heavily exploited of all known grouper spawning aggregation sites in Manus, and they have a high biodiversity value. The squaretail coralgrouper (*Plectropomus areolatus*), brown-marbled grouper (*Epinephelus fuscoguttatus*) and camouflage grouper (*Epinephelus polyphekadion*) aggregate at these three sites in large numbers in the week leading up to the new moon in March, April and May. The white-streaked grouper (*Epinephelus ongus*) also aggregates at one of these three sites during the same lunar and seasonal periods. In early 2004 the communities that own the reefs on which these three aggregation sites are located expressed a strong interest in conserving these aggregations, and consequently, TNCs efforts to date have focused around these three aggregation sites.

These three aggregations come under the customary ownership of four communities from the Titan tribe and they have been fished for subsistence purposes for generations. Titan fishers consider the eggs of aggregating groupers to be a delicacy, and this is the primary reason aggregating serranids are targeted. In recent decades market driven fishing at these aggregation sites has also increased. The predominant fishing methods used by artisanal fishers are night time spearfishing, with fishers typically limiting their activities to lunar days when aggregation numbers are known to peak. Catches are typically smoked and then sold in open markets at Lorengau, the headquarters of Manus Province. The aggregating species most heavily exploited by night time spear fishers is *P. areolatus*. This species is a prime target because it aggregates into very shallow water on the reef and it is typically inactive at night and therefore is easy to spear (Figure 2). Catches from aggregation sites can be large, with several night-time spear fishers capable of removing over 100 *P. areolatus* from an aggregation site in several hours. Many Titan spear fishers refer to night diving at *P. areolatus* aggregation sites as a good way of making “fast money”. Subsistence and artisanal fishing appears to have had a substantial negative impact on these aggregations, with local fishers reporting that catch rates of *P. areolatus* and *E. fuscoguttatus* have declined dramatically in recent decades (Hamilton, 2003). Many fishers are well aware that their activities have caused these declines, listing night time spearfishing, an increase in market driven fishing, and human population growth as the main reasons why they believed catches have declined.

In order to evaluate whether or not these aggregations could be effectively managed at a community level traditional reef owners were interviewed to determine: which clans owned the aggregations; which individuals had access rights to aggregation sites; and what local perceptions were on communities abilities to prohibit fishing on these aggregation sites (Hamilton *et al*., 2004). Our preliminary findings showed that community based management of these three spawning aggregation sites was a feasible option, as customary ownership of the aggregation sites was undisputed, widely known and widely respected. Furthermore, the individuals interviewed from the four Titan communities that own the three aggregations of interest believed that community based management measures would be adhered to if the purpose of these measures were well understood and clearly communicated to all stakeholders (Hamilton *et al*., 2004). It was recognized however that because of social factors such as intermarriage, many individuals have overlapping rights to more than one aggregation site. Thus, ideally, identical management measures would need to be placed on all three spawning aggregations at the same time. Placing management measures on one site but not the others was likely to simply place greater fishing pressure on the aggregation sites that were still open to all forms of fishing.

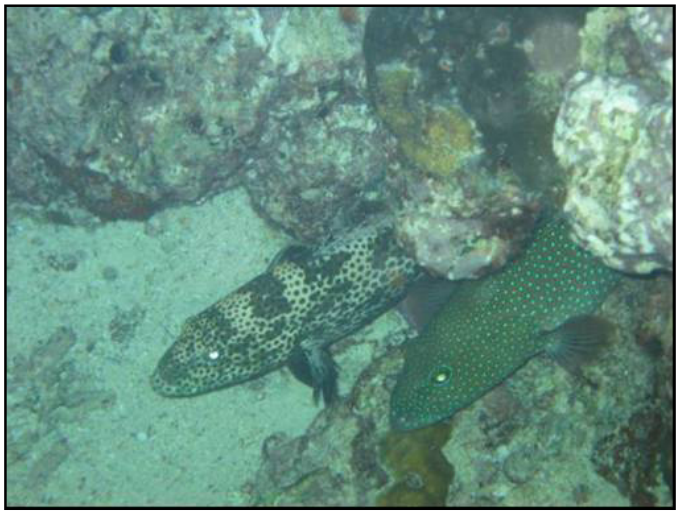

Figure 2: Two resting *P. areolatus* at a spawning aggregation site. This photo was taken at night. The fish on the left is in the camouflage colour phase that is seen in males and females. The one on the right is displaying the yellow/green colour phase only seen in females.

In early 2004 community awareness meetings where held with the customary owners of the three spawning aggregation sites. In these meetings the biology and importance of conserving transient aggregating species was explained and TNC offered each community technical assistance with managing and conserving their aggregations. At the end of these meetings communities told TNC staff that they would discuss the matter among themselves over the next few weeks, and then they would inform TNC what they had decided to do. Several further consultations were held between TNC staff and the communities in early 2004, and by May 2004 the four Titan communities had all agreed to impose identical gear and harvesting restrictions at the three aggregation sites. Spearfishing is now banned at these aggregation sites in the ten days leading up to and including the new moon in every month of the year. Capturing fish for sale is also banned. Subsistence hook and line fishing is currently allowed at these sites, but fishers may only catch enough fish to meet daily food requirements.

After imposing harvesting restrictions at their aggregation sites, all of the Titan communities asked TNC to assist them in monitoring their aggregations so that the effectiveness of their new management strategies could be evaluated. To this end, in May 2004 TNC field staff and trained community members began carrying out UVC monitoring at each of these aggregation sites. Monitoring at these sites is being conducted on SCUBA and involves conducting monthly UVC surveys along permanent belt transects just prior to the new moon. Specific details on the monitoring methodology being employed are outlined in Pet *et al.* (2005).

It is noteworthy that the Titan communities have all made a point of not stating how long harvesting restrictions will be in place. Rather, the communities have stated that the suitability and effectiveness of these initial restrictions will be reassessed in several years time based on the monitoring results. Communities have not ruled out lifting some harvesting restrictions if the numbers of aggregating serranids increase dramatically in the future, and likewise, they have not ruled out taking further steps (i.e. complete site closures or seasonal closures) if future monitoring of these sites indicates that this is necessary.

CASE STUDY 2: NEW IRELAND PROVINCE, PAPUA NEW GUINEA

In a local knowledge survey that was conducted around the Kavieng region of New Ireland Province we documented detailed information on 18 grouper aggregation sites. By conducting Underwater Visual Census surveys at the majority of these sites identified in the local knowledge survey we were able to verify that many of these sites were grouper spawning aggregation sites (Hamilton *et al*., 2004). In the Kavieng region spawning aggregations of groupers are targeted by subsistence, artisanal and commercial Live Reef Food Fish Trade (LRFFT) fisheries. The main forms of subsistence fishing are hook and line and day time spearfishing, while night-time spear fishing is the preferred method of artisanal fishers, with captured fish being sold to fisheries centers and restaurants in Kavieng town. The LRFFT has operated on and off in this region over the past ten years, and these operations have consistently targeted grouper aggregation sites via hook and line fisheries, and by placing lines of traps at known aggregation sites (Figure 3). Fishing pressure has had a marked effect on many grouper aggregations, with local fishers reporting that catch rates of serranids have declined dramatically at 11 of the 18 serranid aggregations identified in the local knowledge survey, and in one instance an aggregation of *P. areolatus* was reported to have been fished to local extinction by a combination of night diving and LRFFT trapping (Hamilton *et al*., 2005).

Figure 3: A still functional fish trap from previous LRFFT operations that that had been left behind at a spawning aggregation site in Kavieng.

In virtually all of the areas we visited the communities were concerned about the status of their aggregations and the impact that increased levels of destructive fishing were having on them. Communities were also eager to have TNC assist them in conserving their aggregations. However ethnographic research revealed that for many aggregations, community based management was unlikely to be effective. In the past traditional reef owners around Kavieng frequently implemented and strictly enforced *tambus* on their reefs for a variety of cultural reasons, with closure periods varying from several months to many years (Aini, 2002). Today however, a combination of inter-tribal marriage, migration and the general demise of traditional management structures have resulted in a situation where the power of many community leaders in the Kavieng region is seriously degraded. In many instances resource owners now have limited capacity to restrict outsiders from fishing in their traditionally defined grounds and customary closed areas are often not respected. Consequently, many community leaders we interviewed mentioned that while they would like to put management measures in place for their aggregations, they did not believe such community based management would be effective unless NGOs or provincial fisheries could assist with enforcing closures.

A closer investigation of the social and political matrix within which the verified grouper aggregations were located revealed that two multi species grouper aggregations were situated within customary sea tenure estates that provided a suitable framework for community based management. These aggregations are located within sea tenure regimes that are reasonably well defined and the aggregations are in close proximity to the communities that claim traditional ownership of them. Importantly, these aggregations are also located on reefs where ownership of the reef on which they occur is undisputed.

Both of these communities had expressed their interest in conserving their aggregations and believed that community based management would be effective. Following community awareness talks on the importance of aggregations, both communities subsequently decided to immediately place *tambus* on their aggregation sites, thereby banning all forms of fishing at these aggregation sites at all times of the year. As was the situation in Manus, local communities were primarily interested in resource recovery, and stated that *tambus* would be in place until the aggregations were deemed to have recovered, at which time management options would be reassessed. As was also the case in Manus, local communities asked TNC to assist with monitoring these sites, and monthly UVC monitoring programs were established at both aggregation sites in July 2004.

The regular presence of TNC field staff at the monitored spawning aggregation sites in Kavieng, and the ongoing community awareness work of TNC field staff, is beginning to have positive flow on effects. For example, in April 2005, one of the communities that TNC is working with decided to ban all forms of fishing at another large grouper spawning aggregation that falls within their CMT boundaries (Tapas Potuku, TNC Kavieng Field Office, *personal communication*). The community that placed this *tambu* on their aggregation site is actively enforcing this recent ban, and immediately after putting this *tambu* in place they informed nearby communities who historically targeted this spawning aggregation site that there would be serious consequences if they were found poaching at this recently closed aggregation site.

CASE STUDY 3. CHOISEUL PROVINCE, SOLOMON ISLANDS

Choiseul Province is a remote sparsely populated province in the Solomon Islands. Fishing pressure on fin fish resources in this region is light, with most fishes being targeted for subsistence purposes only. Grouper aggregations in Choiseul Province were located in local knowledge surveys that were conducted by SCRFA in 2003 and by TNC in 2004. In Choiseul Province TNC is working closely with local communities, provincial fisheries and a powerful local political organization called the Lauru Land Conference of Tribal Community (LLCTC) to conserve grouper aggregation sites. Part of TNCs efforts to date has focused on the northern side of Choiseul, at a Honeycomb grouper (*Epinephelus merra*) aggregation site. Many thousands of *E. merra* aggregate at this site in June and July each year, and fishers can reportedly remove 1000s of these groupers in a single day. Although fishing is only for subsistence purposes, fishers reported that catch rates were significantly lower in 2004 than in any other year in living memory.

The location and background information on this *E. merra* aggregation site was first documented in a SCRFA local knowledge survey that was conducted in 2003 (Hamilton, 2003). In 2004 TNC conducted a further local knowledge survey around the entire Choiseul Province, and the community that owns the reef on which the *E. merra* aggregations form was revisited. Interviews and community awareness talks reveled that key individuals in this community were very interested in conserving their aggregation, and the community also appeared capable of enforcing future management measures, given the tight community cohesiveness and the fact that customary ownership of the aggregation site was well established and undisputed.

During initial consultations this rural community stated that they wished to have the backing of the LLCTC before they formed a partnership with TNC and before any management measures were implemented. Ongoing consultations continued between this community, provincial fisheries staff and the LLCTC in 2004, and on the 1st of February 2005 the community that owns the *E. merra*

aggregation, with backing from the LLCTC, formally declared that that the aggregation site and the surrounding reef area was now a permanent marine reserve, effective immediately. The local community decided on a complete closure rather than a seasonal closure so that the effect of the closure on other species could be seen (i.e. invertebrates and other resident reef fish) and so that other species that potentially used this site at different times of the year for spawning were also protected. TNC was asked to assist with placing permanent markers around aggregation boundaries, and we were also asked to conduct further awareness meetings about the newly formed marine reserve with nearby communities. The community that owns this aggregation site wishes to have their marine reserve recognized under the Solomon Islands national fisheries law as they believe this will assist with compliance, and provincial fisheries is currently assisting with this.

DISCUSSION

In many regions in Melanesia spawning aggregations are in decline and coastal communities are often acutely aware of this. Our case studies show that when the biological importance and susceptibility of aggregations to overfishing are clearly explained to stakeholders, then communities will often express an interest in actively conserving their aggregations. This widespread interest is partly a reflection of the fact that many Melanesian fishers have deduced the link between declining catch rates at aggregation sites and increasing fishing pressure being placed on aggregations. In such scenarios, awareness meetings can be a powerful way of reinforcing and clarifying local assumptions on why aggregations are in decline. Johannes (2002) states that the recent renaissance of community based marine management in many areas of the pacific can be attributed in part to a growing awareness in costal communities of their ability to impact negatively on their natural resources.

Although educational programs can be a very effective way of raising awareness on the need to conserve spawning aggregations, on their own these programs will often be insufficient to bring about effective management of these resources. This was reflected time and time again in the communities we visited, where after community meetings, individuals would inform us that while they appreciated and understood our message, what they really required was long term assistance in managing their inshore fisheries resources (Hamilton, 2003; Hamilton *et al*., 2004). Clearly, if the goal of significantly reducing the overfishing and degradation of spawning aggregations in Melanesia is to be achieved, then community based management initiatives must be supported over a long time frame. This is a role that NGOs and Provincial Fisheries departments can and should provide.

The case studies presented in this paper also show that although many communities may express a desire to manage their aggregations, eroded or disputed CMT estates meant that not all communities are capable of effectively implementing and enforcing community based management measures. This is a fundamentally important point, for if community based conservation efforts are to be effective in Melanesia, then NGOS should initially tailor their efforts on areas of high biodiversity that are located within CMT estates that provide a suitable framework for effective community based management. We recognize however, that this strategy would only serve as a starting point for broader marine biodiversity conservation in this region.

It should also be recognized that spawning aggregations of very high conservation priority will not always occur on reefs that can be effectively managed at a community level, and in areas where community based management is widely inappropriate then other management options such as closed seasons need to be investigated. In Kavieng for example, CMT structures are often eroded, there are multiple aggregation sites and commercial fishing at spawning aggregations occurs. In such settings, management measures such as a seasonal closure that bans purchasing groupers during aggregating periods are highly desirable. To date such measures have not been implemented in Kavieng as the spawning seasonality is largely unknown. It is hoped that the UVC monitoring data being accumulated from the Kavieng region of New Ireland will be able to be used by provincial fisheries to develop such measures in the future. In these situations, tailored multi-pronged fisheries management and

conservation strategies applied at multiple levels (community, Local Level Government, Provincial, and National) are required.

Our case studies demonstrate that in Melanesia communities are primarily interested in resource recovery, and the management measures adopted at aggregation sites in Manus and Kavieng reflect this. However the Choiseul case study is an exception to this, and demonstrates how different environmental, socio-political and economic settings dictate which conservation approaches will be acceptable to rural communities. In conclusion, supporting community based management of reef fish spawning aggregations in Melanesia can have many positive conservation effects: It raises conservation awareness; it can result in communities actively managing their spawning aggregations; it builds a platform for broader future conservation efforts in these areas; and it can have positive flow on effects.

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